REMARKS

Claims 1-8 and 13-20 are pending. Claims 1, 13, 15, 16 and 18-20 are amended.

Claims 1-5, 7, 8, 13 and 14 were rejected under 35 USC §102(a) as being anticipated by US Patent No. 6,410,677, Enoki et al. Favorable reconsideration of this rejection is earnestly solicited.

Enoki et al. is directed to a resin composition for an insulating material, and thus, is not a resist pattern thickening material. One of ordinary skill in the art would not consider Enoki et al. as functioning as a resist pattern thickening material which is capable of thickening a resist pattern of an ArF resist to be thickened.

The composition of Enoki et al. forms a varnish, and thus would not be capable of thickening a resist pattern. Accordingly, Enoki et al. fails to anticipate the presently pending claims.

Claims 1-3, 5-8 and 13-18 were rejected under 35 USC §102(b) as being anticipated by Kanda et al., and claims 19 and 20 were rejected under 35 USC §103(a) as being unpatentable over Kanda et al. in view of Ishibashi et al. Favorable reconsideration of each of these rejections is earnestly solicited.

The claims have been amended to be limited to ArF resist. Furthermore, claim 20 has been amended to delete novolak resists and polyhydroxy styrene resists.

Kanda et al. only uses a KrF resist in its Examples and Ishibashi et al. uses an i-line resist, KrF resist and electron beam resist in its Examples. It is earnestly solicited that Kanda et al.'s composition can not thicken an ArF resist and that Ishibashi et al. does not disclose a process which uses an ArF resist pattern. In support of applicants' position, three articles are submitted herewith in the attached Information Disclosure Statement. These articles will show that a resist patterning thickening material to be applied to a KrF resist does not necessarily produce the same effect as when it is applied to an ArF resist. These articles are all academic papers by co-authors including the inventors of the references applied in the outstanding Office Action.

(1) Advanced Micro-Lithography Process with Chemical Shrink Technology (Takeo Ishibashi et al., Japanese Journal of Applied Physics Vol. 40 (2001) pp. 419-425)
(2) Below 70-nm Contact Hole Pattern with RELACS Process on ArF Resist (Mamoru Terai et al., Advances in Resist Technology and Processing XX, Therodore H. Fedynyshyn, Editor, Proceedings of SPIE Vol. 5039 (2003)
(3) Newly Developed Resolution Enhancement Lithography Assisted by Chemical Shrink Process and Materials for Next-Generation Devices (Mamoru Terai et al., Japanese Journal of Applied Physics Vol. 45, No. 6B (2006) pp. 5354-5358)

The first article (1), Advanced Micro-Lithography Process with Chemical Shrink Technology, discloses that "(t)hough the acetal type KrF positive resist (low activation energy system) can achieve around 0.1μm CH after RELACS processing under the optimized condition, the acrylate type positive resist (high activation energy system) showed less shrinkage under the same process condition. The shrinkage performance of the RELACS process largely depends on the resist chemistry used as the underlying layer" (Abstract. Emphasis added.). Fig. 8 of the first

article clearly shows that the shrinkages between the acetal resists and acrylate resists are different.

Therefore, the first article clearly suggests that it is known that depending on the types of resins, the degree of the thickening varies according to the concentration of photo-acid generators (PAG), which constitutes the resist pattern thickening material, as well as the temperature of the mixing bake. One skilled in the art would not recognize a suitable combination of a resist pattern and a resist pattern thickening material without actual experiments and that the combination cannot be easily inferred based on ordinary technical knowledge.

The second article (2), "Below 70nm Contact Hole Pattern with RELACS Process on ArF Resist," discloses as follows:

> A chemical shrink technology, RELACS™ (Resolution Enhancement Lithography Assisted by Chemical Shrink) utilizes the cross linking reaction catalyzed by the acid component existing in a predefined resist pattern. This "RELAX™" process is a hole shrinking procedure that includes simple coating, baking, and rinsing applied after conventional photolithography. Our target is realize of sub-70nm hole pattern formation by using new RELACS™ for ArF resist. At present, RELACS™ process is introduced to mass production of KrF lithography by using AZ@R200 (Product name of Clariant) mainly. Then first of all we reported process performance of conventional RELACS™ material, AZ@R200, with ArF resist. However, AZ@R200 does not show satisfactory shrinkage on ArF resist. Thereupon, we started on the development of new RELACS™ corresponding to ArF resist. As the result, we developed new RELACS™ material including Cross Linking Accelerator (CLA). It was found that CLA is able to improve reactivity of RELACS™ with ArF-resist. By using this new RELACS™ , it is realized sub-70nm hole pattern formation with ArF-Ex lithography and it is able to control of hole size by mixing bake (MB) temperature and

> additive ratio of CLA. Moreover this process was realized that thickness of shrunk hole is increased.
>
> (Abstract. Emphasis added.)

The authors admit in June 2003 that RELACS™ process is introduced to mass production in KrF lithography, but the conventional RELACS™ material does not show satisfactory shrinkage on ArF resist. In particular, the authors state that their target in June 2003 was to realize sub-70nm hole pattern formation by using new RELACS™ for ArF resist, and they had realized sub-70nm hole pattern formation with ArF-Ex lithography in the second article. The authors admitted that as of June 2003, there had not existed any RELACS™ materials showing satisfactory shrinkage on ArF resist (See page 2, lines 18-26).

The third article (3), "Newly Developed Resolution Enhancement Lithography Assisted by Chemical Shrink Process and Materials for Next-Generation Devices," discloses that "(b)ecause the chemical reaction utilized for a RELACS material for KrF lithography (AZ P200, 500 series) is not useful for ArF-resist chemistry, we have developed a novel chemical reaction system that focuses on the difference in the chemical structure of the reactive sites of a resist polymer (p.5354, right col., lines 12-17. Emphasis added.)." This article also shows that a RELACS™ material is specialized in thickening a KrF resist and it is not suitable for an ArF resist. The article goes on to disclose development of a new material in order to overcome the failing that it cannot be applied to an ArF resist.

The authors of the third article, including Mr. Takeo Ishibashi, state that a RELACS material specialized in thickening a KrF resist was not suitable for an ArF resist, and developed a new material to be applicable to an ArF resist.

It is understood from the first article (1) that depending on the types of resins, the degree of thickening varies, so that one skilled in the art would not recognize a suitable combination of a resist pattern and a resist pattern thickening material without actual experiments. As clearly understood from the second article (2), there had not existed conventional RELACS^{TM} materials showing satisfactory shrinkage on ArF resist as of June 2003. From the third article (3), it is understood that the RELACS material specialized in thickening a KrF resist, as disclosed in Ishibashi et al., was not suitable for an ArF resist.

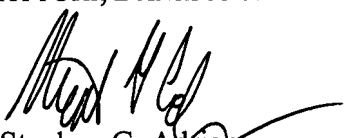
Accordingly, the prior art does not teach or suggest the presently claimed invention. Favorable reconsideration is earnestly solicited.

Should the Examiner deem that any further action by applicants would be desirable to place the application in condition for allowance, the Examiner is encouraged to telephone applicants' undersigned attorney.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP



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SGA/arf

Attachments: Information Disclosure Statement
Petition for Extension of Time